What is claimed is:

1. A heat exchanger for use with active fluid transport, comprising:

(a) a first layer of polymeric material having first and second major surfaces, wherein the first major surface includes a structured surface having a plurality of flow channels that extend from a first point to a second point along the surface of the first layer and that have a minimum aspect ratio of about 10:1 and a hydraulic radius of no greater than about 300 micrometers;

(b) a first cover layer that overlies at least a portion of the structured polymeric surface and includes a closing surface to cover at least a portion of the plurality of flow channels to make plural substantially discrete flow passages; and

(c) a manifold in fluid communication with the substantially discrete flow passages to allow a potential from a potential source to promote fluid movement through the passages from a first potential to a second potential, such fluid movement for thermally affecting the first cover layer of material for promoting heat transfer between the moving fluid and the first cover layer.

2. The heat exchanger of claim 1, wherein said first cover layer comprises a second layer of polymeric material having first and second major surfaces, the first major surface of the second layer including a structured surface having a plurality of flow channels, and the second major surface of the second layer providing the closing surface making the plural substantially discrete flow passages of the first layer.

3. The heat exchanger of claim 2, further comprising at least one additional layer of polymeric material having first and second major surfaces, the first major surface of each additional layer including a structured surface having a plurality of flow channels, the first, second and additional layers of polymeric material being stacked on top of one another to form a stacked array having a plural ordered rows of substantially discrete flow passages.

layers of polymeric material and the first cover layer are arranged in a stacked array, with the first cover layer interposed between an adjacent pair of layers of polymeric material so that the first cover layer covers at least a portion of the structured surface of one of the adjacent pair of layers of polymeric material to make substantially discrete flow passages.

10. The heat exchanger of claim 9, further comprising a plurality of cover layers interposed between the layers of polymeric material and covering at least portions of the structured surfaces of such layers of polymeric material and to make plural ordered rows of substantially discrete flow passages.

11. The heat exchanger of claim 10, wherein each of the plurality of cover layers is interposed between a different pair of adjacent layers of polymeric material so that each cover layer closes the flow channels of the structured surface of one of an adjacent pair of layers of polymeric material to make substantially discrete flow passages.

12. The heat exchanger of claim 9, wherein the flow channels of adjacent layers of polymeric material are substantially linear and are aligned in an angular relationship to each other.

13. The heat exchanger of claim 12, wherein the flow channels of the adjacent layers are aligned substantially parallel to each other.

14. The heat exchanger of claim 12, wherein the flow channels of the adjacent layers are aligned substantially perpendicular to each other.

15. The heat exchanger of claim 1, wherein the first cover layer is more thermally conductive than the first layer of polymeric material.

4. The heat exchanger of claim 1, further comprising a second layer of polymeric material having first and second major surfaces, the first major surface of the second layer including a structured surface having a plurality of flow channels, the second layer being stacked on top of the first cover layer that overlies the first layer to form a stacked array.

5. The heat exchanger of claim 4, further comprising a second cover layer of material, wherein at least a portion of the second major surface of the second layer of polymeric material is secured to the first cover layer, and the second cover layer is secured to at least a portion of the structured surface of the second layer of polymeric material to make substantially discrete flow passages.

6. The heat exchanger of claim 4, wherein at least a portion of the structured surface of the first major surface of the second layer of polymeric material is secured to the second cover layer to cover the flow channels of the second layer of polymeric material to make substantially discrete flow passages.

7. The heat exchanger of claim 6, wherein the flow channels of the first layer of polymeric material and the flow channels of the second layer of polymeric material are substantially linear and are arranged in an angular relationship with respect to one another.

8. The heat exchanger of claim 7, wherein the flow channels of the first and second layers of polymeric material are aligned substantially parallel to each other.

9. The heat exchanger of claim 1, further comprising a plurality of layers of polymeric material, each of the plurality of layers of polymeric material having a first major surface defined by a structured surface formed within the layer, the structured surface having a plurality of flow channels that extend from a first point to a second point along the surface of the layer, the plurality of flow channels having a minimum aspect ratio of about 10:1 and a hydraulic radius of no greater than about 300 micrometers, and wherein the plurality of

16. The heat exchanger of claim 15, wherein the first cover layer includes metal within its composition.

17. The heat exchanger of claim 16, wherein the first cover layer comprises a metal foil.

18. The heat exchanger of claim 10, wherein the plurality of cover layers are more thermally conductive than the layers of polymeric material.

19. The heat exchanger of claim 18, wherein the cover layers include metal within their composition.

20. The heat exchanger of claim 19, wherein the cover layers comprise metal foil.

21. A method of transferring heat between a heat transfer fluid and another media that is to be thermally effected in proximity to a heat exchanger, comprising the steps of:

(a) providing a heat exchanger comprising a layer of polymeric material having first and second major surfaces, wherein the first major surface includes a structured surface having a plurality of flow channels that extend from a first point to a second point along the surface of the layer,

(b) connecting a source of heat exchange fluid having a predetermined initial temperature to the flow passages;

(c) placing the heat exchanger in a position to conduct heat between the other media and the fluid within the heat exchanger; and

(d) providing a source of potential over the flow passages of the heat exchanger, and thereby moving the fluid through the flow passages from a first potential to a second potential, the movement of the fluid causing heat transfer between the moving fluid and the other media so as to thermally affect the media in proximity to the heat exchanger.

22. The method of transferring heat of claim 21, further including a step of providing a cover layer to a portion of the structured surface of the layer of polymeric material having a closing surface to cover at least a portion of the flow channels to make plural substantially discrete flow passages, and wherein the cover layer is placed in a position to conduct heat between the other media and the fluid within the heat exchanger.

23. The method of transferring heat of claim 22, wherein the step of placing the heat exchanger with its cover layer in a position to conduct heat between the other media and the fluid within the heat exchanger includes placing the cover layer of the heat exchanger in direct contact with the other media to conduct heat through conduction between the other media and the fluid within the heat exchanger.

24. The method of transferring heat of claim 22, wherein the step of placing the heat exchanger with its cover layer in a position to conduct heat between the other media and the fluid within the heat exchanger includes spacing the cover layer of the heat exchanger apart from the other media to conduct heat through convection between the other media and the fluid within the heat exchanger.

25. The method of transferring heat of claim 22, wherein:

the step of providing a heat exchanger includes providing a heat exchanger having a second layer of polymeric material stacked on top of the cover layer, the second layer of material having a first major surface that includes a structured surface formed within the layer, the structured surface having a plurality of flow channels that extend from a first point to a second point along the surface of the second layer of polymeric material, at least a portion of the flow channels of the second layer being covered by the cover layer to make plural substantially discrete flow passages; and

the step of placing the heat exchanger with its cover layer in a position to conduct heat includes fluidically connecting the flow passages made by the channels of the second layer of polymeric material to a second source of fluid to conduct heat

between the second source of fluid and the fluid having a predetermined initial temperature.

26. A method for manufacturing a heat exchanger having a plurality of substantially discrete flow passages, comprising the steps of:

(a) providing a layer of polymeric material having first and second major surfaces, wherein the first major surface includes a structured surface having a plurality of flow channels that extend from a first point to a second point along the surface of the layer, the flow channels having a minimum aspect ratio of about 10:1 and a hydraulic radius of no greater than about 300 micrometers;

(b) providing a cover layer of material having a closing surface; and

(c) positioning the cover layer over the channels of the polymeric layer of material so that its closing surface makes a plurality of substantially discrete flow passages.

27. The method for manufacturing a heat exchanger of claim 26, further comprising the step of bonding the cover layer to at least a portion of the structured polymeric surface to cover the flow channels.

28. The method for manufacturing a heat exchanger of claim 26, further comprising the steps of:

providing a second layer of polymeric material having first and second major surfaces, wherein the first major surface includes a structured surface having a plurality of flow channels that extend from a first point to a second point along the surface of the layer; and

securing the second layer of polymeric material to the cover layer of the heat exchanger to form a stacked array.

29. The method for manufacturing a heat exchanger of claim 28, wherein the step of securing the second layer of polymeric material to the cover layer includes securing at least a portion of the structured surface of the second layer to the cover layer to cover the flow channels of the second layer and make substantially discrete flow passages.

30. The method for manufacturing a heat exchanger of claim 28, wherein the step of securing the second layer of polymeric material to the cover layer includes securing the second major surface of the second layer to the cover layer, and further comprising the steps of:

providing a second cover layer of material; and

securing the second cover layer to at least a portion of the structured surface of the second layer of polymeric material to cover the discrete flow channels of the second layer and make substantially discrete flow passages.